International Journal of Agricultural
Science and Research (IJASR)
ISSN (P): 2250-0057; ISSN (E): 2321-0087
Vol. 12, Issue 1, Jun 2022, 87–96
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CHARACTER ASSOCIATION AMONG YIELD COMPONENT CHARACTERS AND WITH SEED YIELD IN GREENGRAM (*VIGNA RADIATA*(L.) WILCZEK)

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ABSTRACT

The present investigation consists of 20 genotypes of greengram, which were grown in the Field Experimentation Centre of the Department of Genetics and Plant Breeding, SHUATS, Prayagraj during Kharif,2019, following RBD with three replications. The data was collected on 11 characters in order to investigate genetic variation and character association. IC-314674, followed by BM-2002-1, and PM-6, were recognised as desirable genotypes for seed yield per plant based on mean performance. Seed yield per plant and harvest index both had high GCV. Harvest index and quantity of pods per plant both showed high PCV. Seed yield per plant and pod length had high heritability estimates, while a number of clusters per plant, plant height, harvest index, number of pods per plant, biological yield, days to 50% flowering, and number of seeds per pod had moderate heritability. The number of primary branches and seed index had low heritability. Traits having a high heritability and a high genetic advance as a percentage of the mean are thought to be regulated by additive gene action, with equal contributions from additive and non-additive gene activity. Harvest index, seed index, number of clusters per plant, and number of pods per plant all exhibited a highly significant positive relationship with seed yield per plant. Days to 50% flowering, number of major branches per plant, number of clusters per plant, and number of pods per plant all had positive direct effects on grain output. As a result, these features could be employed as a viable selection indicator for greengram yield improvement by selective breeding.

KEYWORDS: Greengram GCV, PCV, Heritability, Variability, Genetic Advance, Correlation & Path Analysis

Received: Nov 04, 2021; **Accepted**: Nov 24, 2021; **Published**: Feb 21, 2022; **Paper Id.**: IJASRJUN202209

Original Article

INTRODUCTION

Greengram (Vignaradiata (L.) Wilczek, (2n=22, genome size of 579 Mb) Phaseolus aureus Roxb., Phaseolusradiatus L.) is one of India's thirteen edible legumes and the country's third most important pulse crop after chickpea and pigeon pea. It is a valuable short-term grain legume and a low-cost source of nutritional protein for low-income populations. Aside from their great nutritional content, they have the unique ability to maintain and restore soil fertility through biological nitrogen fixation and the addition of organic matter to the soil through leaf drop, which is very beneficial for subsistence agriculture. Greengram is produced on an area of 3.44 million hectares in India, with a total yield of 1.42 million tonnes and an average productivity of 638.98 kg/ha. Orissa, Maharashtra, Andhra Pradesh, Karnataka, Rajasthan, Madhya Pradesh, Tamil Nadu, Bihar, and Uttar Pradesh are important greengram farming states in India (Indiastat.com 2018-2019). Mungbean productivity is low, as is the case with other pulse crops. Mungbean is a pulse crop, and pulses have become the focus of agricultural policy planning in recent years, particularly as a result of their rising prices, the draining of valuable foreign exchange in imports to cover the shortfall, and the long-term effects of cereal-based cropping systems on soil health, declining

productivity, and long-term farming system sustainability. To meet the pulses demand, the National Food Security Mission expects a 4% increase in pulse production.

MATERIALS AND METHODS

A total of 20 Greengram genotype accessions were gathered from the Indian Institute of Pulse Research in Kanpur for this study (Uttar Pradesh). Three replications are used to evaluate the accessions using the randomised block design (RBD). During Kharif 2019, researchers conducted research at the Field Experimentation Centre of the Department of Genetics and Plant Breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Allahabad) (U.P.). The current study aims to determine the degree of genetic variability, heritability, genetic progress, yield contributing components, as well as direct and indirect effects on Greengram accessions. Plant height (cm), number of primary branches per plant, number of clusters per plant, number of pods per plant, pod length (cm), number of seeds per pod, seed index (g), biological yield per plant (g), harvest index (percent), and seed yield per plant were among the 11 features reported (g).

RESULT AND DISCUSSIONS

A comparison of 20 greengram genotypes revealed that the IC-314674 genotype had the highest seed yield per plant (7.43), seed index (2.90), number of seeds per pod (9.65), and number of pods per plant (17.46), followed by BM-2002-1 (7.40) and PM-6 (7.40). (7.22).

For all of the traits, the phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) are not very high. Seed yield per plant (15.52), harvest index (13.75), number of clusters per plant (12.03), and number of pods per plant (11.66) had moderate GCV estimates, while pod length (8.07), number of primary branches (7.83), number of seeds per pod (7.52), biological yield (6.80), plant height (4.97), seed index (4.04), and days to 50% flowering had low GCV estimates (3.59).

Harvesting index (20.91), number of pods per plant (18.44), seed yield per plant (17.13), number of clusters per plant (16.00), number of primary branches (14.30), number of seeds per pod (13.45), biological yield (11.71), and pod length (10.10) all had moderate PCV estimates, while seed index (8.46), plant height (7.38), and days to 50% flowering all had low PCV estimates (6.21).

High (>60 percent) Seed yield per plant (79.00), pod length (63.74), and moderate (30-60 percent) for number of clusters per plant (56.58), plant height (45.28), harvest index (43.19), number of pods per plant (39.98), biological yield (33.68), days to 50% flowering (33.39), number of seeds per pod (31.26), and low (30 percent) for number of primary branches (29.96) and seed index (22.77).

For the first time, a high genetic advance as a percentage of the mean was reported. Seed yield per plant (27.87 percent), number of clusters per plant (18.65 percent), harvesting index (18.61 percent), and number of pods per plant (15.18 percent) had the highest genetic advance as a percent of mean, while pod length (13.27 percent), number of primary branches per plant (8.83 percent), number of seeds per pod (8.66 percent), biological yield (8.13 percent), and plant height (6.13 percent) had moderate genetic grain (3.97 percent).

Seed yield per plant exhibited a significantly significant positive link with harvest index (0.919**), number of clusters per plant (0.390**), number of pods per plant (0.346**), and number of seeds per pod (0.332**) in a genotypic

correlation coefficient study.

Seed yield per plant exhibited a significantly significant positive relationship with harvest index (0.739**), number of pods per plant (0.369**), seed index (0.368**), number of clusters per plant (0.357**), and number of seeds per pod (0.337**) according to phenotypic correlation coefficient analysis.

Days to 50% flowering, number of clusters per plant, number of pods per plant, and pod length were found to have a positive and direct effect on seed yield, whereas plant height, number of primary branches per plant, number of seeds per pod, seed index, biological yield, and harvest index had a negative direct effect on seed yield per plant.

Days to 50% flowering, number of primary branches, number of clusters per plant, biological yield, and harvesting index all had a positive and direct effect on seed yield, while plant height, pod length, number of seeds per pod, and seed index all had a negative direct effect on seed yield per plant, according to phenotypic path coefficient analysis.

CONCLUSIONS

The genotypeIC-314674 was determined to be the most desired genotype, with the highest grain yield and harvest index. In the genotypes that were analysed, there was a lot of variation. Harvest index, number of seeds per pod, and number of clusters per plant all exhibited a strong and positive association with seed yield per plant. Days to 50% blooming and pod length both had significant positive direct effects on seed output. As a result, selection on these features can be used to boost greengram yield.

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Table 1: Analysis of Variance for 11 Quantitative Characters in Greengram

S. No	Characters	Mean Sum of Squares		
		Replications (d. f=02)	Treatments (d. f=19)	Error (d. f=38)
1	Days to 50% flowering	15.65	9.84**	3.93
2	Plant Height	50.96	48.12**	13.82
3	No. of primary branches	0.49	0.29*	0.13
4	No. of cluster per plant	11.77	2.55**	0.44
5	No. of pods per plant	2.06	16.23**	5.41
6	Pod length	0.81	1.37**	0.22
7	No. seeds per pod	3.81	3.16*	1.34
8	seed index	0.06	0.10*	0.05
9	Biological yield	10.44	6.61**	2.62
10	Harvesting index	71.98	104.78**	20.74
11	seed yield per plant	0.06	2.62**	0.21
∗5% of significance ∗∗ 1% of significance				

Table 2: Estimates of Genetic Variability Parameters for Different Quantitative Characters in Greengram

S. No	Characters	Coefficient of Variation		Heritability	Genetic Advance	Genetic Advance as % of Mean (5%)
		GCV	PCV			
1	Days to 50% flowering	3.59	6.21	33.39	1.67	4.27
2	Plant Height	4.97	7.38	45.28	4.69	6.88
3	No. of primary branches	7.83	14.30	29.96	0.26	8.83
4	No. of cluster per plant	12.03	16.00	56.58	1.24	18.65
5	No. of pods per plant	11.66	18.44	39.98	2.47	15.18
6	Pod length	8.07	10.10	63.74	1.02	13.27
7	No. seeds per pod	7.52	13.45	31.26	0.90	8.66

8	seed index	4.04	8.46	22.77	0.12	3.97
9	Biological yield	6.80	11.71	33.68	1.38	8.13
10	Harvesting index	13.75	20.91	43.19	6.58	18.61
11	Seed yield per plant	15.22	17.13	79.00	1.64	27.87
GCV = Genotypic coefficient of variation PCV = Phenotypic coefficient of variation						

Table 3: Genotypic Correlation between seed yield and its Components in Greengram.

Characters	Plant Height	No. of primary branches	No. of clusters/ plant	No. of pods/ plant	Pod length	No. of seeds/ pod	Seed Index	Biological yield	Harvesting Index	Seed yield/ Plant
Days to 50% Flowering	0.018	-0.018	-0.068	-0.345**	0.155	0.343**	0.479**	0.319*	0.174	0.142
Plant height	**1**	0.269*	0.404**	-0.298*	0.078	-0.372**	-0.007	0.198	0.125	0.115
No. of primary Branches		**1**	0.447**	-0.537**	0.21	-0.402**	-0.12	-0.107	-0.058	-0.033
No. clusters/ Plant			**1**	-0.704**	0.074	-0.229	-0.312*	0.13	0.386**	**0.390****
No. pods/ Plant				**1**	-0.084	0.173	0.203	0.419**	-0.551**	**0.346****
Pod length					**1**	0.006	-0.290*	0.466**	0.055	0.149
No. of seeds/ Pod						**1**	0.601**	0.173	-0.592**	**0.332****
Seed index							**1**	0.842**	0.508**	-0.847**
Biological Yield (g)								**1**	-0.143	0.218
Harvesting Index (%)									**1**	**0.919****
* 5% level of significance ** 1% level of significance										

Table 4: Phenotypic Correlation between seed yield and its Components in 20 Greengram

Characters	Plant height	No. of primary branches	No. of clusters/plant	No. pods/ plant	Pod length	No. of seed/ pod	Seed index	Biological yield	Harvesting index	Seed yield/ plant
Days to 50% Flowering	0.082	-0.237	-0.147	-0.024	0.328**	0.006	0.311**	0.288*	-0.026	0.063
Plant Height	**1**	0.291*	-0.342**	0.294**	0.016	-0.187	-0.016	-0.367**	0.19	0.112
No. of primary Branches		**1**	0.189	-0.398**	0.101	0.421**	-0.063	-0.019	-0.403**	0.108

No. of clusters/ Plant			**1**	-0.385**	0.084	-0.068	-0.631**	0.099	0.198	**0.357****
No. of pods/ Plant				**1**	0.044	-0.461**	0.072	0.261*	-0.243	**0.369****
Pod length					**1**	0.051	-0.521**	0.164	0.302*	0.134
No. of seeds/ pod						**1**	0.623**	0.063	-0.470**	**0.337****
Seed Index							**1**	0.041	-0.260*	**0.368****
Biological Yield								**1**	-0.442**	0.082
Harvesting Index									**1**	**0.739****
*5% level of significance**1% level of significance										

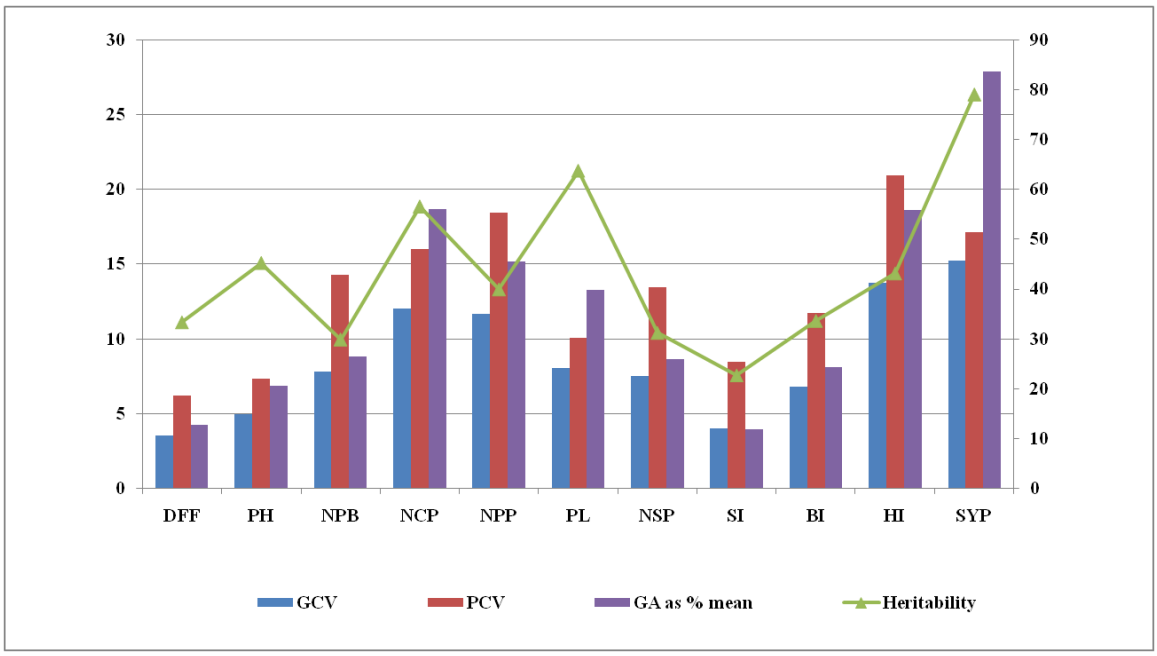
Table 5: Direct and Indirect Effects of Component Characters on Seed yield Genotypic

Characters	Days to 50% flowering	Plant height	No. of primary branches	No. of clusters/ plant	No. of pods/ plant	Pod length	No. of seeds/ pod	Seed index	Biological yield	Harvesting index
Days to 50% flowering	**0.9724**	-0.0019	0.0082	-0.1459	-0.7039	0.0497	-0.2821	-0.3099	-0.3540	-0.0903
Plant height	0.0358	**-0.1042**	-0.1213	0.8626	-0.6087	0.0251	0.3055	0.0047	-0.2195	-0.0647
No. of primary branches	-0.0356	-0.0280	**-0.4518**	0.9555	-0.0976	0.0674	0.3301	0.0779	0.1190	0.0300
No. of clusters/ plant	-0.1348	-0.0421	-0.2022	**0.1354**	-0.4369	0.0237	0.1878	0.2020	-0.1436	-0.1995
No. of pods/ plant	-0.6799	0.0311	0.2428	-0.5025	**0.0422**	-0.0268	-0.1420	-0.1313	-0.4646	0.2850
Pod length	0.3054	-0.0081	-0.0949	0.1579	-0.1706	**0.3208**	-0.0048	0.1875	-0.5160	-0.0284
No. of seeds/ pod	0.6770	0.0387	0.1815	-0.4880	0.3528	0.0019	**-0.8218**	-0.3888	-0.1922	0.3065
Seed index	0.9441	0.0008	0.0543	-0.6664	0.4142	-0.0929	-0.4936	**-0.6474**	-0.9332	0.5733
Biological yield	0.6301	-0.0206	0.0485	0.2767	0.8561	0.1494	-0.1425	-0.5452	**-0.1082**	0.0742

Harvesting index	0.3441	-0.0130	0.0262	0.8234	-0.1248	0.0176	0.4868	0.7173	0.1588	**-0.5174**

Table 6: Phenotypic Path for Seed yield and its Component

Characters	Days to 50% flowering	Plant height	No. of primary branches	No. of clusters/ plant	No. of pods/ plant	Pod length	No. of seeds/ pod	Seed index	Biological yield	Harvesting index
Days to 50% flowering	**0.0826**	-0.0077	-0.0042	-0.0266	-0.0030	-0.0002	0.0000	-0.0136	0.0587	-0.0231
Plant height	0.0068	**-0.0938**	0.0016	0.0187	-0.0214	-0.0001	0.0010	0.0022	0.0249	0.1725
No. of primary branches	-0.0196	-0.0086	**0.0176**	0.0342	-0.0027	-0.0005	0.0003	0.0088	-0.0084	0.0871
No. of clusters/ plant	-0.0121	-0.0097	0.0033	**0.1810**	-0.0485	-0.0004	0.0004	0.0206	0.0429	0.1796
No. of pods/ plant	-0.0020	0.0160	-0.0004	-0.0696	**0.1261**	-0.0002	-0.0003	-0.0100	0.1129	-0.2197
Pod length	0.0034	-0.0015	0.0018	0.0152	0.0055	**-0.0048**	-0.0003	0.0055	0.0711	0.0381
No. of seeds/ pod	0.0005	0.0176	-0.0008	-0.0123	0.0075	-0.0003	**-0.0055**	-0.0338	0.0271	-0.1860
Seed index	0.0080	0.0015	-0.0011	-0.0266	0.0090	0.0002	-0.0013	**-0.1402**	0.0180	-0.2355
Biological yield	0.0112	-0.0054	-0.0003	0.0179	0.0328	-0.0008	-0.0003	-0.0058	**0.4332**	-0.4001
Harvesting index	-0.0021	-0.0179	0.0017	0.0359	-0.0306	-0.0002	0.0011	0.0365	-0.1914	**0.9057**
Residual Effect= 0.18810										



Graph 1: Histogram Depicting Genetic Parameters for 11quantitative Characters in Greengram.

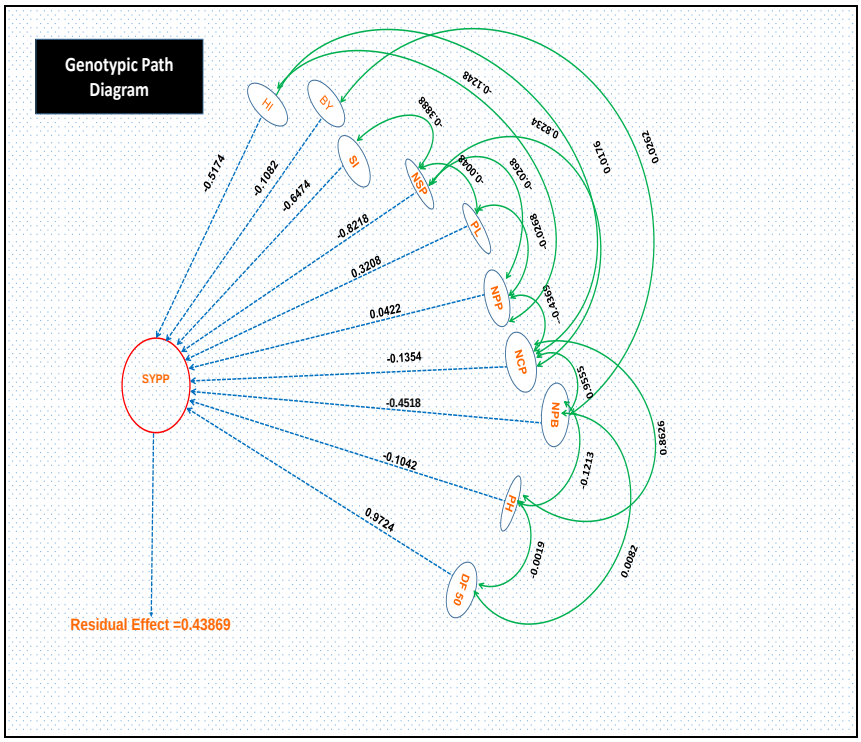


Diagram 1: Genotypic Path Diagram for Seed Yield per Plant.

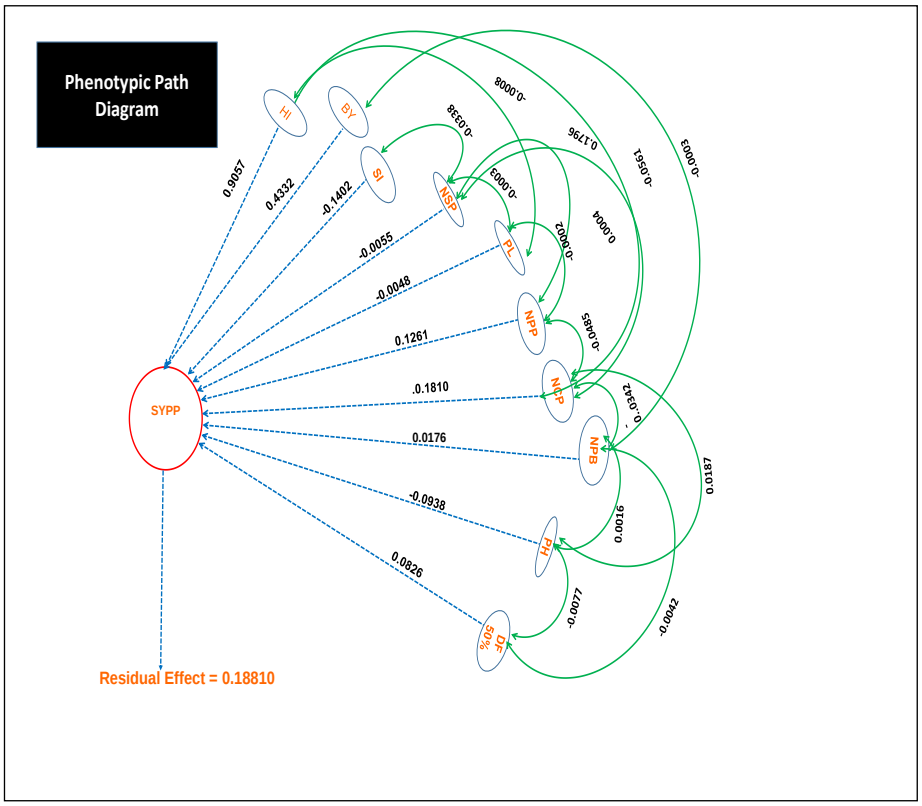


Diagram 2: Phenotypicpath Diagram for Seed yield Plant.